

REMARKS

Reconsideration of the application in view of the above amendments and the following remarks is requested. Claims 14-20 and 23-35 are in this application. Claims 14, 23, 29, and 32 have been amended. Claims 1-13 and 21-22 have been cancelled. The specification has also been amended to recite related application information.

The Examiner rejected claims 23-28 and 32 under 35 U.S.C. §112, second paragraph, due to insufficient antecedent basis in claims 23 and 32. Claims 23 and 32 have been amended to correct this inadvertent error.

The Examiner rejected claims 14-20 and 23-35 under 35 U.S.C. §103(a) as being unpatentable over Krishnan (U.S. Patent No. 5,998,299) in view of Misawa et al. (U.S. Patent No. 6,150,725). For the reasons set forth below, applicant respectfully traverses this rejection.

Claim 14 recites:

“forming a layer of conductive material on a conductive region and a layer of insulation material;

“etching the layer of conductive material to form a trace, the trace having a first length, a first width, a first height, a top surface and a bottom surface;

“etching the trace to form a slot opening in the top surface of the trace, the slot opening having a conductive bottom surface that completely lies above the bottom surface of the trace, a second length, a second width, and a second height, the first and second lengths being substantially equal; and

forming a layer of isolation material over the trace to fill up the slot opening, the layer of isolation material contacting the conductive bottom surface of the slot opening.”

Claims 23 and 29 recite similar limitations. Claim 29 recites a plurality of slot openings.

In rejecting the claims, the Examiner pointed to dielectric layer 201 shown in FIG. 15A of Krishnan as constituting the insulation material required by the claims, and via 202 shown in FIG. 15A of Krishnan as constituting the conductive region required by the claims. Further, the Examiner pointed to the formation of metal layer 210 on dielectric layer 201 and via 202 shown in FIG. 15A of Krishnan as constituting the "forming a layer of conductive material" element of the claims.

In addition, the Examiner appeared to point to the etch of metal layer 210 as constituting the "etching the layer of conductive material" element and the "etching the trace to form a slot opening" element required by the claims. With respect to forming a slot opening, the Examiner appears to point to the openings between the four vertical extensions of metal layer 210 shown in FIG. 15C as constituting the slot openings.

The Examiner acknowledged that the Krishnan reference does not teach the "forming a layer of isolation material" element required by the claims, but pointed to insulating films 120 and 121 shown in FIG. 10 of Misawa as teaching the formation of a layer of isolation material. The Examiner then argued that one skilled in the art would be motivated to form a layer of insulating material as taught by Misawa to fill up the spaces between the four vertical extensions of metal layer 210 to form multilevel connected conductors.

Applicant notes, however, that it is not possible for a layer of isolation material to be formed to fill up a slot opening as required by the claims because the slot opening pointed to by the Examiner only temporarily exists during an etch. The Krishnan reference teaches that FIG. 15C illustrates the appearance of metal layer 210 part way through an etch that removes all of the exposed regions of metal layer 210, as well as some of the material within contact/via 202.

"The structure is then subjected to a metal etch as shown in FIG. 15c. As . . . etching continues and the metal material between the lines 216 is removed as well as some of the material within contact/via 202, the connection to substrate is severed." (See column 5, lines 52-61 of Krishnan.)

Thus, following the etch, the four vertical extensions of metal layer 210 are no longer connected together or to contact/via 202. The etch results in four spaced-apart metal regions that are isolated from each other and from contact/via 202. As a result, even if a layer of isolation material were subsequently formed in the spaces between the four metal regions, it is not possible for the layer of isolation material to fill up a slot opening as required by the claims since a slot opening no longer exists once the etch has been completed.

To remove any ambiguity from the claims, independent claims 14, 23, and 29 have been amended to recite that the bottom surface(s) of the slot opening(s) is conductive and completely lies above the bottom surface of the trace, and that the layer of isolation material contacts the conductive bottom surface(s) of the slot opening(s).

Thus, since the bottom surfaces of the openings shown in FIG. 15C of Krishnan no longer lie above the bottom surface of metal layer 210 once the etch has been completed, it is therefore not possible to fill up the openings with an isolation material after the etch so that the isolation material contacts a conductive bottom surface that lies above the bottom surface of the trench.

As a result, independent claims 14, 23, and 29 are patentable over Krishnan in view of Misawa. In addition, since claims 15-20, claims 24-28, and claims 30-35 depend either directly or indirectly from claims 14, 23, and 29, respectively, claims 15-20, claims 24-28, and claims 30-35 are patentable over Krishnan in view of Misawa for the same reasons as claims 14, 23, and 29.

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Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are requested.

Respectfully submitted,

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